Written Comments to the California Energy Commission's "Draft Strategic Plan for Distributed Generation"

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The California Energy Commission's "Draft Strategic Plan for Distributed Generation" provides a much-needed framework for the development of policies to enhance future energy security within the state and in surrounding regions. A focus on the deployment of DG systems, particularly those providing combined heat and power services, (i.e. cogeneration) affords a highly effective strategy for countering runaway demand for electricity in the commercial sector.

In every component of the U.S. economy . . . except commercial electricity usage . . . energy consumption has increased at a slower rate than overall economic output (inflation-adjusted GDP). As shown in Table 1, the U.S. economy has grown over the past 25 years at a pace roughly 3 _ times that of total energy usage, despite the dismal performance by commercial electricity users.

TABLE 1 – U.S. Energy vs. Economic Growth – 1975 to 2000

· Total U.S. GDP (Real)	Up 128 percent
· Commercial kWh	Up 155 percent
America's Fastest Growing Energy Sector	
· Residential kWh	Up 101 percent
· Total U.S. kWh	Up 94 percent
· Industrial kWh	Up 56 percent
· Total U.S. Energy	Up 37 percent
· Passenger Vehicle Fuel (Including cars, light trucks, and SUV's)	Up 25 percent

Surprisingly, the much-maligned automobile industry has actually turned in a stellar record of efficiency gains over the past 25 years, with overall fuel consumption rising just 25% - - - despite a 78% increase in total miles driven each year.

Since the opportunities for Distributed Generation are concentrated within the commercial and light industrial sectors, there are significant efficiency benefits to be

gained through the aggressive deployment of both existing and future DG technologies. Target applications include hotels, schools, apartments, health clubs, hospitals, supermarkets, food processing operations, nursing homes and other similar facilities requiring a spectrum of on-site energy services that include electricity, space-heating, refrigeration, air conditioning and hot water supply. In the CEC's Draft Plan, two of the five suggested policy objectives, cited in the section entitled "General Strategies", pertain to "Improved End Use Efficiency" and "Promotion of Cogeneration". These initiatives can play a significant role in reversing the long history of spiraling electricity usage (and rising emissions) attributable to the commercial sector.

Fortunately, there is no need to wait for new and yet-to-be-proven technologies in order to begin reaping the benefits of DG throughout the California marketplace. Thanks to the development of reliable, efficient and environmentally clean gas engine technologies over the past decade, DG is now a reality for even the smallest scale commercial, light industrial and institutional energy users. Advances in microprocessors, catalytic emission controls and Internet-based remote monitoring technologies have sharply altered the competitive balance between DG and conventional centralized power generation.

An example of currently available DG performance can be seen in the gas-engine powered Tecogen system first introduced in the 1980's. These competitive economically viable modular cogeneration units, , have delivered over 23 million hours of service at hundreds of customer sites across the U.S. and abroad. Individual engines operate for more than 20,000 hours between overhauls, and the complete systems are maintained under contract at a guaranteed cost of just 2 cents per kWh. Overall energy efficiencies (LHV) exceed 90 percent, with over 31 percent of fuel heating value converted to electricity and another 60 percent recovered from the engine and exhaust to provide heating services. Using advanced microprocessor engine controls and automotive-derived triple catalysts, exhaust emissions are well below the tightest regional standards, including those to be implemented for California in 2003.

There is a widespread misconception that reciprocating gas engines are inefficient and incapable of meeting strict environmental limits. In fact, the combined electrical and thermal efficiency of Tecogen's equipment is unmatched by any competing technology . . . now and for the foreseeable future. Moreover, recent permits applications in central California have been written at 5 ppm NO_x for our cogeneration units using the latest, advanced emissions control systems – this corresponds to 0.09 pounds per MWHr when credited for recovered heat . . . significantly below the 2003 California standard. As further evidence of their low emission performance, 10 Tecogen engines employed in cooling service by an actual, California School District achieved average NO_x emissions of 2.8 ppm when tested ***after one full year of operation.***

Therefore, we urge the CEC not to discard the most practical and extremely efficient and clean DG technology -- namely, internal combustion engines – in its strategic planning.

The proposed 2007 California emission standards correctly account for the value of waste heat-recovered from DG systems by incorporating an allowance to compensate for avoided emissions from on-site boilers producing hot water and space heating services. Because the proposed standard recognizes this dramatic "source" efficiency benefit of DG – for the first time in this country we believe -- it represents an important milestone in environmental legislation. Here also we urge the commission to support this essential aspect of the proposed emission standard.

The energy efficiency of combined heat and power systems, relative to conventional central station production of electricity, yields important reductions in both the criteria pollutants, and in CO_2 emissions as well. Tecogen systems, for example, emit approximately 1300 pounds of CO_2 per MWh of electricity generated, while also producing useful heat that displaces 8.7 million Btu in boiler fuel.

In order to compare this with conventional practices, based upon electricity from a modern combined cycle powerplant of 52 percent efficiency (LHV), it is necessary to combine the CO_2 emissions of the powerplant with the emissions from on-site boilers. Allowing for 10 percent transmission losses, the powerplant emits 875 pounds of CO2 per MWh delivered to users. Combining this with boiler emissions of 1050 pounds for 8.7 million Btu of gas fuel, the total CO2 from conventional power and heat production is 1925 pounds per MWh, or 48 percent more than that for a combined heat and power strategy.

Distributed Generation will capture an increasing share of future energy markets in California and elsewhere. The pace of DG deployment can be accelerated through the effective use of balanced incentives and regulatory policies designed to insure competition on a level playing field. In particular, regulators should continue to promote development of reasonable and cost-effective standards for interconnection of DG systems with the electricity grid. Also, there is a need to prevent predatory pricing schedules by utilities that are specifically targeted against DG projects. A viable DG industry can only evolve in an environment of rational rules and predictable cost structures. Sudden perturbations, such as the arbitrary allocation of utility stranded costs to DG operators, can retard the growth of DG capacity by inhibiting access to financing and by undermining market confidence in the regulatory environment affecting DG economics.

With respect to funding support for development and demonstration of new technologies, priority should be given to technologies that improve the efficiency of energy utilization. For example, there is an opportunity to enhance the effectiveness of DG systems through increased year-around use of recovered waste heat. One promising technology uses absorption cooling to produce air conditioning service from low temperature (200ºF) heat. This could have a major impact on future energy demand in California by displacing a portion of today's electric cooling load with waste-heat activated cooling during summer months when other uses for on-site heating services are minimal.

The global benefits of deploying gas-engine powered DG in California extend well beyond the narrow comparison between DG and the latest combined cycle powerplant technology. In fact, California's electricity demand is served, in part, by power transmitted from various segments of the national utility grid . . . over half of which is fueled by coal. Heavy concentrations of coal-based generation in the mountain states now provide electricity to California. To the extent that in-state DG can supplant the out-of-state burning of coal, California can reduce the overall CO_2 impact upon global warming. For example, every MWHr of electricity from coal-by-wire that can be displaced by DG will reduce CO_2 emissions from 3,220 pounds, (2,170 from a coal-burning powerplant and 1,050 pounds from a gas-fired on-site boiler), to just 1,300 pounds from a Tecogen DG system. Thus, by substituting DG for coal-electricity, California can reduce CO_2 by a factor of 2 _ to 1 for each incremental MWHr that won't have to come from coal!